

# memorandum

TA-53 Accelerator HP Office ESH-1 Health Physics Operations Los Alamos, New Mexico 87545 To/MS: LANL ALARA Committee, c/o B. Bates

Thru: B. Somers, ESH-1, K487 From/MS: J. Bliss, ESH-1, H815

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Symbol: ESH-1-02/TA-53: 006 Date: February 19, 2002

SUBJECT: ESH-1/TA-53 CY2002 ALARA Goal

- 1. <u>CY2002 ALARA Goal</u>. The following dose equivalents are submitted as goals for the ESH-1 team at TA-53 for CY2002:
  - a. Collective Dose: 2500 person-mrem, as measured by LANL TLD.
  - b. Collective Shallow Dose: No goal established.
  - c. Collective Committed Dose Equivalent: No goal established.
  - d. Average Worker Non-Zero Dose (external): 105mrem.
  - e. Maximum Worker Dose (external): 550 mrem.
  - f. Number of positive Internal Uptakes: No goal established.
  - g. Major Project or Job-Specific Collective Dose: No goal established.
  - h. Prorated Collective Dose Goals (person-mrem):

January	100	February	100
March	100	April	200
May	200	June	150
July	250	August	300
September	300	October	300
November	300	December	200

## 2. Reasons or Basis for Goal.

- a. Most activities at TA-53 are projected to remain stable between CY2001 and CY2002. Installation of a new 1L target is planned for late in the maintenance period. The dose budget for this task is unknown and may require a change to the ESH-1/TA-53 goal.
- b. As discussed in the LANSCE Dose Optimization report, corrective maintenance is a large contributor to the collective dose of LANSCE-12 and ESH-1/TA-53. The number of corrective maintenance actions and the exact location of the work cannot be predicted. It is unlikely that the 91% availability of the LANSCE LINAC experienced in CY2001 will be repeated in CY2002.

### 3. Discussion

Daily posting of electronic personnel dosimeter (EPD) measurements insures that dose budgets (individual and collective) for approved activities are not exceeded. EPD dose tracking has is now available in the Radiation Protection Automation System (RPAS) and this real time tracking has increased awareness of worker dose and the doses received to perform specific tasks.

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ESH-1 file

# CY2002 EPD Summary for Selected RWPs

641.8 6 641.8 6 9.1 6 9.1 6 900 1 115.8 1 161.5 9 2 305 4 150 1 538 6 100 1 150 1 500 5 202 3 500 5 203 3 500 5 203 3 500 5 204 3 36 2 208 6 21 6 22 3 36 2 164.7 1 164.7 1 165.3 5 66 693.4 2 17 203.9 5 17 203.9 5 18 20	HWP No. Purpose	Dose	Dose Goal		Collective D	ose by Groun		0 T N
On-thine         6418         600         L-2         L-3         L-3         ESH-1         Apparea the it water systems           12         Construction         485.2         600         306.2         18.6         19.3         IPF Installation           4         PAL         PAL         14.1         60         8.8         18.1         Relationship to the system of			person mRem		Derson	n mBem		Work Summary
1 Fourtine         641.8 GOO         600         305.2 GO         418.2 GO         137.4 GOardae the 1 t. water systems           4 Fourtine         641.8 GOO         600         306.2 GOSTHOLIGH         151.2 GO         151.4 GOARDAE         151.4 GOARDAE         151.4 GOARDAE         151.4 GOARDAE         151.4 GOARDAE         151.5 GOAR				L-2	1-3	1-7	ESH-1	
2         Construction         48.32         600         306.2         11.2         Appliante in 11, water systams           4         PM         9.1         100         529.8         11.1         Reptation in 11.3         Reptation in 11.3           7         Fourline         60.0         100         529.8         11.1         Reptation in 11.3         Reptation in 11.3           9         PM         16.5.9         200         121.7         30.0         Integeritor in 18.8           9         PM         16.5.9         200         121.7         34.2         Reptation in 18.8           9         PM         165.9         200         121.7         34.2         Reptation in 18.8           9         PM         165.9         200         121.7         34.2         18.6           9         PM         305         17.4         16.5         10.9         Hastachermaticspocifor in 18.8           9         PM         305         17.7         16.5         10.9         Hastachermaticspocifor in 18.8           9         PM         305         10.0         17.4         16.5         10.9         Hastachermaticspocifor in 18.8           9         PM         305         1		-	200			418.2	407 4	
4 PMM         9.1         6.0         8         7.3         PP Path and path path and p		-	009	306.2		410.5	4.76	Operate the 1L water systems
6         Routine         900         1000         55.9 s         111.5         Inquestions in PSR (115.9)         Inquestion in PSR (115.9)         Inquesti		-	09	8			D 7	IPF Installation
7         Routine         115.8         120         68.5         14.5         10.5         Inspace on in PSR           0         PAM         161.5         300         14.15         20         Install tywater wiles           0         PAM         165.9         200         16.5         200         Install sectoralists           5         PAM         305         400         16.5         10.7         34.2         Replace has extensiones           5         PAM         305         400         16.5         10.7         34.2         Replace a tage of wider wiles           7         PAM         508         600         12.2         60.8         10.7         10.75         Replace a tage of wiles           8         Construction         15.1         500         165.3         34.1         16.2         Work with C-13 source           9         PAM         201         400         165.3         34.1         16.2         Work with C-13 source           1         CAM         201         400         165.3         34.1         16.2         Work with C-13 source           1         CAM         200         56.8         300         165.3         34.1         16.2		900	1000	529.8			1000	Replace 1L water system PRVs
9         PM         161.5         300         CCCC         141.5         12.0         Massauremalninapolino in PSR           0         PM         365.9         200         121.7         34.2         Regisse heat exchangers           0         PM         165.9         200         17.4         16.5         Regisse heat exchangers           0         PM         165.0         17.4         16.5         16.5         Regisse heat exchangers           0         PM         165.0         17.4         16.5         16.5         Regisse heat exchangers           1         PM         165.0         17.4         16.5         16.5         Most with C-13' source           2         PM         202         300         153.8         34.1         22.3         With with C-13' source           3         CAM         201.7         400         153.8         34.1         22.3         With with C-13' source           4         PM         202         5.46         300         1.65.3         34.1         1.25         Most with C-13' source           5         Exp         500         5.46         200         3.6         1.03         1.04         1.04         1.04         1.04	-	115.8	120	69.5			6.601	Inspections in PSR
0         PM         156.9         200         171.3         34.2         Install diguest voluses           6         PM         305         400         16.5         3.2         197.5 <td> -</td> <td>161.5</td> <td>300</td> <td>200</td> <td></td> <td>,</td> <td>18.6</td> <td>Measurement/inspection in PSR</td>	-	161.5	300	200		,	18.6	Measurement/inspection in PSR
5         PM         305         400         17.1.         342.         Replaces Cultigan Portless           6         PM         505         627.8         10.7.5         10.7.5         Replace Cultigan Portless           3         Exp         100         17.4         16.5         0.0.5         Install Shiading           3         Construction         12.0         620.8         60.0         6.0.5         Not with C.137 source           3         Construction         15.1         500         165.3         4.6         Not with C.137 source           3         Construction         16.1         900         165.3         34.1         16.2         Not with C.137 source           4         DM         201.7         400         165.3         34.1         16.2         Not with C.137 source           5         Exp         300         6.88         3.4.1         20.3         10.8         17.4         20.2           5         Exp         200         5.88         3.0.1         1.1.5gate support foil in PSR           6         Exp         200         3.6         3.5         1.5.4         1.5.4         1.5.4           6         Exp         200         3.6 <td></td> <td>155.9</td> <td>200</td> <td></td> <td></td> <td>0,141</td> <td>20</td> <td>Instail igt water valves</td>		155.9	200			0,141	20	Instail igt water valves
S PM         150         17.4         16.5         19.5	-	305	400			121.7	34.2	Replace heat exchangers
7         PM         538         600         521.6         10.3         Wire standing and alignment relations           3         Construction         100         1.2         S21.6         10.0         Work with C-137 source           3         Construction         15.1         500         155.8         34.1         0.6         Work with C-137 source           3         CM         201.7         400         155.8         34.1         4.6         Install should see and alignment           3         CM         201.7         400         165.3         34.1         Accidented seed and s	_	150	17.4	16.5		197.5	107.5	Replace Culligan bottles
Exp         100         1.2		538	900	521 B			6.0	Install Shielding
Construction   15.1   500   153.8   4.6   Install timulos   201.7   400   153.8   4.6   Install timulos   202   202   300   155.8   34.1   20.3   37.7   Vactum leak work in PSR   202   300   155.3   34.1   22.3   U.O.N   20.1   20.0   3.6   20.3   34.1   22.3   U.O.N   20.1   20.0   3.6   20.3   3.6   1.5   PBI corrosion app   15.4   20.0   3.6   1.5   PBI corrosion app   1.5		100	1.2	0:120			16.2	Wire scanner removal and aligment
CM         2017         400         153.8         4.0         Install whosk in PSR           EM         202         300         165.3         34.1         22.3         Vacaum leak work in PSR           EM         202         300         0.8         34.1         22.3         Vacaum leak work in PSR           EM         202         300         0.8         0.8         0.9         Tq4 survey           EMP         204         300         0.8         0.8         0.9         Tq4 survey           EMP         24         300         0.8         0.9         Tq4 survey         1.0           Moultine         36.4         200         3.6         1.6         1.1 rarget call work           Moultine         182         100         1.0.8         0.9         1.5 T         Cable pull in PSR           Moultine         184.7         200         3.6         2.9.3         3.0.1         1.1 rarget call work           Active         164.7         200         140.9         57.4         4.5         1.1 rarget call work           Moultine         184.7         1.00         140.9         57.4         4.5         1.1 rarget call work           CM         222.3	-	-	500				0.0	Work with C-137 source
PM         202         300         165.3         34.1         Acutum leak work in PSR1           8         EXP         500         548         34.1         22.3         UCM           8         Survey         2.9         300         0.8         0.9         Tg4 survey           9         EXP         20         0.8         0.9         Tg4 survey           9         EXP         20         3.5         6.6         1.1 angle cent work           9         CM         20         3.5         6.0         1.1 angle cent work           9         CM         20         3.5         6.0         1.1 angle cent work           9         CM         20         3.6         6.0         1.1 angle cent work           9         Fourtine         3.5         10.8         3.5         1.5 work           1         CM         200         3.6         1.5         Cabe point in PSR           1         Routine         82         10.0         1.1 angle cent work         1.5 work           1         Routine         199.6         200         1.40.9         57.4         93.1         1.1 angle cent work           1         Routine         189		-	400	153 B			4.0	Install thimbles
8         Exp         500         548         34.1         20.7         Replace stripper foll in PSR           2         Survey         2.9         300         0.8         0.9         15         PbB corresion exp           8         PM         58.4         200         0.8         3.5         20.3         UCM         1.1 Target call work           9         CM         201.6         200         3.6         6.6         1.5 A work         1.1 Target call work           0         CM         201.6         200         3.6         6.6         1.5 A work         1.1 Target call work           0         CM         201.6         200         3.6         6.1         1.5 A work         1.5 A work           0         Fourtine         164         200         140.9         57.4         93.1         Intractiste Hg Tpt           0         Fourtine         164         200         140.9         57.4         93.1         Intractiste Hg Tpt           0         M         229.3         180         219         1.4.5         2.0         1.4.5         2.0         1.4.5 work           0         M         229.3         180         27.2         4.5         4.5 <td></td> <td>202</td> <td>300</td> <td>165.3</td> <td></td> <td></td> <td>31.1</td> <td>Vacuum leak work in PSR</td>		202	300	165.3			31.1	Vacuum leak work in PSR
Survey         2.9         300         0.8         2.5.3         0.9         10.0         10.9         10.0         10.0         10.0         10.0		200	548		34.1		30.7	Replace stripper foil in PSR
S EXP         24         300         3.5         1.5         PBI correspondence           9 PM         59.4         200         3.5         29.3         30.1         1.1 Farget coal work           9 PM         201.6         200         3.6         9.3         30.1         1.1 Farget coal work           9 Routine         8.2         100         1.0.8         3.6         1.5         Cabb pull in PSR           1 Routine         8.2         100         1.0.8         57.4         93.1         Infragate Hg Tandiane Hg		2.9	300		a		26.3	OCN
9 PM         59.4         200         3.6         1.5         Pebe corroston app           9 Fulfine         3.6         201.6         200         3.6         1.6         1.0 </td <td>-</td> <td>24</td> <td>300</td> <td></td> <td>2 6</td> <td></td> <td>45</td> <td>Igt 4 survey</td>	-	24	300		2 6		45	Igt 4 survey
CM         201.6         200         3.6         195         6.6         11. Say work           Poutline         3.6         200         3.6         9.0         11. Say work           Exp         100         10.8         7.4         15.7         Cabb pull in PSR           Exp         164,7         1750         140.9         57.4         93.1         Inadiate Hg Tgt           Routine         182.6         200         140.9         57.4         93.1         Inadiate Hg Tgt           Routine         182.6         200         140.9         57.4         93.1         Inadiate Hg Tgt           Routine         184         220         180         219         4.5         11. St call work           CM         229.3         180         219         7.2         4.5         11. St call work           CM         922         600         722         141         23         Vacuum work in PSR           CM         922         600         722         150         8.8         Vacuum work in PSR           CM         932         600         97.2         200         97.2         13.3           CM         2699.6         2500         2340	_	59.4	200		2	000	200	PbBi corroston exp
Routine         3.6         200         3.6         1. SA work           Fourine         82         100         10.8         57.4         93.1         Catesmine as-built dimensions           Fourine         82         100         10.8         57.4         93.1         Catesmine as-built dimensions           Fourine         164.7         1750         140.9         57.4         93.1         Irradiale Hy TR           Fourine         199.6         200         140.9         57.4         93.7         sinpact foal in PSR           Fourine         146.7         225         18         225         4.5         1 Tat call work           Fourine         164         200         122         4.5         1 Lat work           CM         269.3         180         219         1 Lat work           CM         922         600         722         Change lon pump in PSR           CM         693.4         750         621         1 Sour work in PSR           CM         1.3         500         97.2         1 Sour work in PSR           PM         7         200         2340         1 136.7         1 Instruction page in PSR           PSR         550         250		201.6	200		•	28.3	30.1	1L. Target cell work
5         Routine         82         100         10.8         57.4         15.7         Cable pull in PSR           5         Exp         164.7         1750         10.8         57.4         93.1         Infigure led In PSR           6         Exp         164.7         1750         140.9         57.4         93.1         Infigure led In PSR           7         Routine         145         225         18         225         1.4         23         1.1 Tat ceal work           8         Routine         164         200         219         4.5         1.5 A work           CM         229.3         180         219         2.5         1.5 A work           CM         93.4         750         620         97.2         5.8         1.5 A work           CM         93.4         750         621         7.2         Charge ion pump in PSR         7.2         Charge ion pump in PSR           CM         1.3         500         97.2         5.8         7.2         Charge ion pump in PSR           CM         2.689.6         2500         97.2         5.8         1.13.5         Fix leak in bean pipe in PSR           PSR         505         1750         5594.3		3.6	200	36		Cal	0.0	1L SA work
Spanish         15.7         Cable pull in PSR           Routine         199.6         200         140.9         57.4         93.1         Irradiate Hg Tgt           Routine         199.6         200         140.9         57.4         93.1         Irradiate Hg Tgt           Routine         145         225         18         122.5         4.5         1. Tgt call work           CM         229.3         180         219         72         4.5         1. Lgt call work           CM         229.3         180         219         72         Accuum work in PSR           CM         692.         600         722         Change lon pump in PSR           CM         693.4         750         621         72         Change lon pump in PSR           PM         1.3         500         97.2         5.8         Vacuum leak in PSR           CM         2689.6         2500         2340         373         46.1         136.6         Hg Exp           PSR         6774.7         725         65.8         156.7         Hg Exp         Hg Exp           FSR         6774.7         725.0         634.8         136.7         136.8         Hg Exp <td< td=""><td></td><td>82</td><td>100</td><td>10.8</td><td></td><td></td><td>1</td><td>Determine as-built dimensions</td></td<>		82	100	10.8			1	Determine as-built dimensions
Routine         199.6         200         140.9         97.7         93.1         Intradiale Hg Tgt           Routine         145         225         18         12.5         4.5         1.5 Tit per foil in PSR           CM         229.3         180         219         141         23         1.1 St post foil in PSR           CM         229.3         180         219         4.5         1.1 St cell work           CM         922         600         722         4.5         1.1 St work in PSR           CM         922         600         722         150         Replace SRSV22 in PSR           CM         1.3         500         97.2         72         Change ion pump in PSR           PM         7         200         621         72         Change ion pump in PSR           CM         2689.6         2500         2340         5.8         Vacuum isak in PSR           FXp         505         1750         6243         46.8         1366.7         113.5         Fix leak in beam pipe in PSR           PSR         6774.7         7250         5943.4         46.8         1366.7         1368.6         Hg Exp           PSR         6774.7         7250 <td< td=""><td></td><td>164.7</td><td>1750</td><td>22</td><td>57.4</td><td></td><td>7.0</td><td>Cable pull in PSR</td></td<>		164.7	1750	22	57.4		7.0	Cable pull in PSR
Routine         145         225         1 FG.5         4.5         1 Tig call work           Routine         164         200         180         219         141         23         1 Tig call work           CM         229.3         180         219         141         23         1 SA work           CM         922         600         722         20         72         Acuum work in PSR           CM         693.4         750         672         72         Change ion pump in PSR           CM         1.3         500         97.2         5.8         Vacuum work in PSR           PM         7         200         97.2         5.8         Vacuum work in PSR           CM         2689.6         2500         2340         5.8         Vacuum leak in PSR           CM         2689.6         2500         2340         5.8         Vacuum leak in PSR           EXp         505         1750         2340         373         9         Fx leak in beam pipe in PSR           PSR         6774.7         7250         5591.1         0         634.8         Hg Exp           PSR CM         4737.3         4930         4153         0         0         69	_	199,6	200	140 0	t.		1.55	Irradiate Hg Tgt
Fourine         164         200         12.5         4.5         1 Tgt call work           CM         229.3         180         219         150         150 work           CM         922         600         722         200         722         Accuum work in PSR           CM         1.3         500         97.2         Change ion pump in PSR         5.8         Vacuum leak in PSR           CM         1.3         500         97.2         5.8         Vacuum leak in PSR           CM         2689.6         2500         2340         5.8         Vacuum leak in PSR           CM         2689.6         2500         2340         113.5         Fix leak in beam pipe in PSR           Exp         605         1750         65943.4         468.8         1366.7         1369.6         Hg Exp           PSR CM         4737.3         4930         4153         0         0         694.8         Hg Exp           1L         2003.9         2702.4         46.1         0         0         379         431.4           1L         2003.9         2702.4         46.1         0         1366.7         431.4           1 L         2003.9         2702.4		145	225	18		1 000	7.80	Stripper foil in PSR
CM         229.3         180         219         141         23         1L SA work           CM         922         600         722         150         Replace SRSV02 in PSR           CM         922         600         722         Change ion pump in PSR           CM         1.3         500         97.2         Change ion pump in PSR           PM         7         200         97.2         Change ion pump in PSR           CM         2689.6         2500         2340         6.1         Interlock checks (1LC)           FXp         505         1750         2340         96         Hg Exp           PSR         6774.7         7250         55943.4         468.8         1366.7         Hg Exp           PSR CM         4737.3         4930         4153         0         694.8         Hg Exp           1L         2003.9         2702.4         46.1         0         694.8         431.4           5 Total "official" dose         2702.4         46.1         0         1366.7         431.4           5 Total "official" dose         7796         431.4         2708		164	200	2		6.221	4.5	1L Tgt cell work
CM         922         600         722         150         Replace SRS/02 in PSR           CM         693.4         750         621         72         Change ion pump in PSR           CM         1.3         500         97.2         72         Change ion pump in PSR           PM         7.2         200         97.2         5.8         Vacuum leak in PSR           CM         2689.6         2500         2340         6.1         Interfock checks (1LC)           EXP         505         1750         2340         96         Hg Exp           PSR         6774.7         7250         5591.1         0         694.8         Hg Exp           PSR CM         4737.3         4930         4153         0         0         694.8           1L         2003.9         2702.4         46.1         0         1366.7         431.4           1 Colal "official" dose         2702.4         46.1         0         1366.7         431.4		229.3	180	210		141	23	1L SA work
CM         693.4         750         621         72         Change ion pump in PSR           CM         1.3         500         97.2         5.8         Vacuum leak in PSR           PM         7         200         2340         6.1         Interlock checks (1LTC)           CM         2689.6         2500         2340         113.5         Fix leak in beam pipe in PSR           PSR         505         1750         5943.4         468.8         1366.7         Hg Exp           PSR CM         4737.3         4930         4153         0         0         694.8           1L         2003.9         2702.4         46.1         0         1366.7         431.4           1L         2003.9         2702.4         46.1         0         1366.7         431.4           1 Cotal "official" dose         2596         1331         2410         2208		922	900	799			(	Vacuum work in PSR
CM         1.3         500         97.2         Change ion pump in PSR           PM         7         200         97.2         5.8         Vacuum leak in PSR           CM         2689.6         2500         2340         6.1         Interlock checks (1LTC)           Exp         505         1750         373         96         Hg Exp           PSR           PSR         Hg Exp         Hg Exp           PSR CM         4737.3         4930         4153         0         694.8           1L         2003.9         2702.4         46.1         0         379         431.4           1 Colal "official" dose         2500.8         1331         2410         2208	<del> </del>	693.4	750	621			130	Replace SRSV02 in PSR
PM         7         200         2340         6.1         Interlock checks (1LTC)           CM         2689.6         2500         2340         468.8         113.5         Fix leak in beam pipe in PSR           PSR         10553.5         15701.6         5943.4         468.8         1366.7         1368.6         Hg Exp           PSR CM         4737.3         4930         4153         0         694.8         437.4           1L         2003.9         2702.4         46.1         0         1366.7         431.4           2 Total "official" dose         2702.4         46.1         0         1366.7         431.4		1.3	500	97.2			7/	Change ion pump in PSR
CM         2689.6         2500         2340         Anitoriock checks (1LC)           Exp         505         1750         373         96         Hg Exp         Hg Exp           PSR         6774.7         7250         5591.1         0         0         694.8         Hg Exp           PSR CM         4737.3         4930         4153         0         0         694.8         1366.7         431.4           1 LL         2003.9         2702.4         46.1         0         1366.7         431.4         431.4           2 Total "official" dose         2706.4         46.1         0         1366.7         431.4         431.4		7	200	1			3.0	Vacuum leak in PSR
Exp         505         1750         373         1366.7         1368.6         Hg Exp           PSR         6774.7         7250         5591.1         0         0         694.8           PSR CM         4737.3         4930         4153         0         0         694.8           1L         2003.9         2702.4         46.1         0         1366.7         431.4           5 Total "official" dose         5796         1331         2410         2208		2689.6	2500	2340			140 F	Interlock checks (1LTC)
PSR         10553.5         15701.6         5943.4         468.8         1366.7         1368.6         1368.6           PSR CM         6774.7         7250         5591.1         0         694.8         1368.6           1L         2003.9         2702.4         46.1         0         1366.7         437.4           5 Total "official" dose         2702.4         46.1         0         1366.7         431.4           5796         1331         2410         2208	-	505	1750		373		96	HX leak in beam pipe in PSR
6774.7         7250         5591.1         0         0         694.8           4737.3         4930         4153         0         0         379           2003.9         2702.4         46.1         0         1366.7         431.4           5796         1331         2410         2208		10553.5	15701.6	5943.4		1366.7		
4737.3         4930         4153         0         0         379           2003.9         2702.4         46.1         0         1366.7         431.4           5796         1331         2410         2208	PSR	6774.7	7250	5591.1		0	694.8	914/.
2003.9         2702.4         46.1         0         1366.7         431.4           5796         1331         2410         2208	PSH CM	4737.3	4930	4153	0	0	379	0283.
5796 1331 2410 2208	71.		2702.4	46.1	0	1366.7	431.4	453
	o lotal "official" dos	e)		5796	1331	2410	2208	1844.



TA-53 Accelerator HP Office ESH-1 Health Physics Operations Los Alamos, New Mexico 87545 To/MS: LANL ALARA Committee, c/o B. Bates

Thru: W. Somers, ESH-1, K487

Thru: J. Graham, LANSCE-FM, H814 D 505 6

From/MS: J. Bliss, ESH-1, H815

Phone/FAX: 7-5890/5-5387

Symbol: ESH-1-02/TA-53: 007

Date: February 19, 2002

SUBJECT: ESH-1/TA-53 and LANCE Dose Optimization Report.

# 1. Greatest source of dose.

- a. Analysis of electronic personal dosimeter (EPD) records of 32 out of 146 radiation work permits (RWPs) that contributed significantly to worker dose at TA-53 (all hazard category 2 and 3 RWPs plus 6 others) identifies the Proton Storage Ring (PSR) as the primary source of dose at TA-53. See attachment.
- b. Work in the PSR was responsible for 67% (6285 mrem of 9147 mrem) of all recorded dose, 94% (5591 mrem of 5943 mrem) of LANSCE-2 dose and 32% (695 mrem of 2208 mrem) of ESH-1/TA-53 dose.
- c. Corrective maintenance (CM) in the PSR was responsible for 70% (4153 mrem of 5943 mrem) of all LANSCE-2 dose and 74% of LANSCE-2 PSR dose.

# 2. Other sources of dose at TA-53.

- a. Work on the 1L target (including the 1L target cell and 1L service area) contributed 20% (1844 mrem) of the TA-53 dose. 1L target work was responsible for 100% of the LANSCE-7 dose on these RWPs and 56% of all LANSCE-7 official dose is accounted for on eight 1L target RWPs. RCT support for1L target work contributed 19% of the ESH-1/TA-53 dose.
- Two series of experiments in the Blue Room contribute significantly to LANSCE-3 dose (35% or 469 mrem of 1331 mrem) and to ESH-1/TA-53 dose (10% or 226 mrem of 2208 mrem).
- Conducting accelerator shut-down surveys is another significant source of dose to ESH-1/TA-53 RCTs.

# 3. Methods implemented to reduce the doses received from identified sources.

- a. Work is routinely delayed, when possible, to allow for the decay of short-lived activation products. This strategy is very effective in the PSR, but cannot be employed when a failure occurs during scheduled beam time. Delays of 1 to 2 days are possible during scheduled run-cycle "source recycle" periods, and up to two months of decay can be built into the maintenance schedule during the four month LINAC maintenance period.
- b. Remote handling techniques are used when possible. LANSCE-7 has a very proficient remote handling crew with years of experience. This capability can result in small additional dose to LANSCE-7, however, as other LANL organizations utilize this capability to perform high dose jobs.

- c. Careful planning is done for all work conducted in a high radiation area at TA-53: RCT coverage is an essential element, as well as pre-job rehearsals, the use of alarming EPDs, and detailed briefings. Pre-job planning and rehearsals often include "dry-runs" using mock-ups, and use has been made of digital photographs of the work area to brief workers.
- d. Temporary shielding is often employed when it can be placed without interfering with the work. Care must be taken to ensure that LINAC components are not damaged by the careless placement of heavy shielding materials.
- e. Removing the source of radiation, by means of draining activated water systems or flushing the radioactive liquid waste lines has been effective in reducing dose rates and collective doses received by workers. Removal of major sources of radiation in the early steps of a procedure has also contributed to reduction of doses during certain PSR CM operations.
- f. Upgrades and improvements to improve LINAC reliability and/or maintainability also have the potential to greatly reduce doses received performing CM. In particular, re-plumbing the quadrapole magnets in the PSR reduced the time necessary to repair a water hose leak from 8 hours to 30 minutes with a corresponding reduction in dose received.

# 4. Potential (unimplemented) dose reduction possibilities.

- a. Further improvements in LINAC reliability and maintainability have the greatest potential to reduce the collective dose to TA-53 workers.
- Reducing the time and number of technicians required to perform accelerator shut-down surveys could reduce doses received by ESH-1/TA-53 by up to 200 person-mrem per year.
- c. It would be possible to use more moveable shielding in certain locations within the PSR if a crane was available.

## 6. Discussion.

- a. Additional engineering support and funding within LANSCE-2 would make it possible to design, construct ready spares of LINAC components likely to fail. Swift replacement or, rather than repairing, highly activated components would reduce maintenance time, improve availability and reduce worker doses. LANSCE-2 has requested additional resources. The unpredictable nature of component failures makes a cost benefit analysis difficult, but it is likely that 2 to 3 person-rem could be saved annually at a cost of \$1,000,000 to \$1,5000,000 dollars.
- b. Reducing the time and number of technicians required to perform accelerator shut-down surveys could be accomplished by using data-logging survey instruments and standard (bar-coded) survey points. The LANL ESH-1/ESH-4 Instrument Working Team is evaluating several possible instruments that would meet this operational need. New instruments would cost \$15,000 to \$20,000 and would last five ten years for a cost of \$7,500 to \$20,000 per person-rem saved.
- c. The addition of a crane has been proposed as a capital improvement to the PSR for each of the last few years. Total cost is estimated to be about \$3,000,000. Total dose savings are unknown.

# 1 Attachment, CY2002 EPD summary for selected RWPs

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ESH-1 file w/att